

In the Claims

1-14. (cancelled)

15. (new) A process for ignition of combustion of fuel in a combustion space of an engine, comprising the steps of:

conveying fuel into the combustion space;

producing microwave energy in a microwave source located outside the combustion space;

injecting the microwave radiation into and uniformly throughout the combustion space with fuel therein in at least one microwave pulse of short duration and of high energy;

absorbing the microwave pulse by the fuel distributed into the combustion space;

igniting the fuel uniformly over a large space in the combustion space by energy delivered into the fuel due to absorption of the microwave pulse essentially at the same time; and

preventing formation of plasma by selection of a time interval for injecting of the microwave radiation, of power of the microwave radiation, of pulse duration and of pulse spacing.

16. (new) A process according to claim 15 wherein

at least one of a number of spaced microwave pulses, power of the microwave pulses, pulse duration and pulse timing is controlled depending on engine operating states and power demands on the engine.

17. (new) A process according to claim 15 wherein
the microwave radiation is injected in 1 to 10 spaced microwave pulses.
18. (new) A process according to claim 17 wherein
the microwave radiation is injected in 1 to 5 spaced microwave pulses.
19. (new) A process according to claim 15 wherein
said microwave pulse has a power between 1 kW and 70 kW.
20. (new) A process according to claim 15 wherein
the microwave pulse has a duration between 1 ns and 2 ms.
21. (new) A process according to claim 17 wherein
the microwave pulses are spaced between 100 ns and 2 ms.
22. (new) A process according to claim 15 wherein
the microwave radiation is injected in 1 to 10 spaced microwave pulses;
each microwave pulse has a power between 1 kW and 70 kW; and
each microwave pulse has a duration between 1 ns and 2 ms.
23. (new) A process according to claim 22 wherein
the microwave radiation is injected in 1 to 5 spaced microwave pulses.

24. (new) A process according to claim 15 wherein

the microwave radiation is injected in several spaced microwave pulses of at least one of different power and different pulse duration for leveling temperature increases of the fuel in the combustion space up to an ignition temperature by gradual delivery of energy.

25. (new) A device for igniting combustion of fuel on a combustion space of an engine, comprising:

a microwave source located outside of the combustion space and producing spaced microwave pulses; and

a microwave window connected to said microwave source through which the microwave pulses are injected in and uniformly throughout the combustion space of the engine to be absorbed by fuel uniformly in all of the combustion space with the fuel being ignited uniformly by the microwave pulses when absorbed by the fuel due to energy delivery at the same time, without forming of plasma by selection of a time interval for injecting the microwave pulses, of power of the microwave pulses, of pulse duration and of pulse spacing.

26. (new) A device according to claim 25 wherein

the microwave window is mounted on an engine at a combustion chamber thereof.

27. (new) A device according to claim 25 wherein

said microwave source is connected to an electric power supply source to deliver electrical pulses to said microwave source converted to the spaced microwave pulses by said microwave source.

28. (new) A device according to claim 25 wherein

a coupling between said microwave source and said microwave window transmits the microwave pulses sent from said microwave source to said microwave window, but avoids transmitting microwaves reflected by the combustion space back into said microwave source.

29. (new) A device according to claim 28 wherein

said coupler is connected to said microwave source and said microwave window by microwave lines.

30. (new) A device according to claim 29 wherein

said coupler comprises first, second and third ports connected to said microwave source, said microwave window and a passive microwave consumer, respectively.

31. (new) A device according to claim 25 wherein

said microwave window comprises ceramic material.

32. (new) A device according to claim 25 wherein

said microwave window is formed completely of ceramic material.

33. (new) A device according to claim 25 wherein

said microwave source is connected to said microwave window by a flexible line.

34. (new) A device according to claim 26 wherein

said engine is one of an Otto engine, a Wankel engine, a spark ignition direct engine and a diesel engine in which a fuel-air mixture is ignited in said combustion chamber thereof.

35. (new) A process according to claim 15 wherein

the microwave radiation is injected into the combustion space in spaced microwave pulses.